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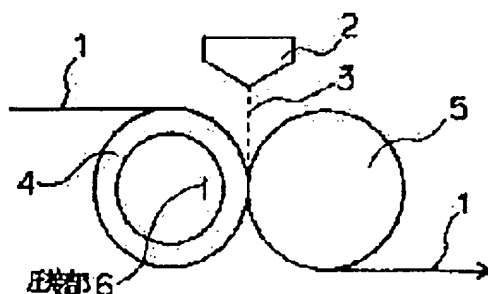
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## (54) PRODUCTION OF LAMINATED METAL SHEET

(57)Abstract:

PURPOSE: To obtain method and device for producing a thermoplastic resin- coated metal sheet having superior adhesion, processability, corrosion resistance, and appearance with a good yield.

CONSTITUTION: A contact bonding roll 5 is depressed on a preheated metal sheet 1 wound on a winding roll 4. A melted thermoplastic resin 3 falls down to a gap between the contact bonding roll 5 and the metal sheet 1 from a T die 2 through an extruder, whereby the metal sheet 1 is coated with the resin. Next, the metal sheet 1 is wound around the contact bonding roll 5 to be pulled out, cooled, and taken up. In this method, the width of the resin film to fall is set to be larger than the width of the metal sheet 1. The metal sheet is coated all over the full width thereof using the width-direction center part of the film of the thermoplastic resin 3. Holes are opened on the surface of the winding roll 4. Gas is jetted out of the holes, or the thermoplastic resin is sucked through the holes.



The film of the thermoplastic resin 3 adheres to the winding roll 4. The resin adhering to the

roll surface is mechanically scraped downstream of the winding roll 4. In this laminated metal sheet production method, the overcoating resin is prevented from adhering on the winding roll 4.

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## MEANS

[Means for Solving the Problem] this invention to namely, the preheated metal plate which was twisted around the roll with (1) volume Carry out the pressure welding of the sticking-by-pressure roll, flow down the thermoplastics film fused from the T die through the extruder in the gap of a sticking-by-pressure roll and a metal plate, and thermoplastics is covered to a metal plate. Subsequently, it sets to the method of manufacturing the lamination metal plate which twists a metal plate around a sticking-by-pressure roll, and pulls it out. While making larger than the width of face of a metal plate width of face of the thermoplastics film which flows down in the gap of a sticking-by-pressure roll and a metal plate, having it in the crosswise center section of the thermoplastics film and covering full [ of a metal plate ] The manufacture method of the lamination metal plate characterized by preparing the hole with which the portion by which the overcoat was carried out twisted it, and the resin carried out opening on the surface of the roll in order to prevent the thermoplastics film which flowed down more greatly than the width of face of a metal plate twisting, and sticking to a roll, [0020] (2) Carry out the pressure welding of the sticking-by-pressure roll to the preheated metal plate which was twisted around the roll with a volume. In the method of manufacturing the lamination metal plate which flows down the thermoplastics film fused from the T die through the extruder in the gap of a sticking-by-pressure roll and a metal plate, covers thermoplastics to a metal plate, and twists and pulls out a metal plate subsequently to a sticking-by-pressure roll While making larger than the width of face of a metal plate width of face of the thermoplastics film which flows down in the gap of a sticking-by-pressure roll and

a metal plate, having it in the crosswise center section of the thermoplastics film and covering full [ of a metal plate ] While preparing the hole with which the portion by which the overcoat was carried out twisted it, and the resin carried out opening on the surface of the roll in order to prevent the thermoplastics film which flowed down more greatly than the width of face of a metal plate twisting, and sticking to a roll The manufacture method of the lamination metal plate characterized by injecting a gas [ near the pressure-welding section ] from the hole which carried out opening, [0021] (3) Carry out the pressure welding of the sticking-by-pressure roll to the preheated metal plate which was twisted around the roll with a volume. In the method of manufacturing the lamination metal plate which flows down the thermoplastics film fused from the T die through the extruder in the gap of a sticking-by-pressure roll and a metal plate, covers thermoplastics to a metal plate, and twists and pulls out a metal plate subsequently to a sticking-by-pressure roll While making larger than the width of face of a metal plate width of face of the thermoplastics film which flows down in the gap of a sticking-by-pressure roll and a metal plate, having it in the crosswise center section of the thermoplastics film and covering full [ of a metal plate ] While preparing the hole with which the portion by which the overcoat was carried out twisted it, and the resin carried out opening on the surface of the roll in order to prevent the thermoplastics film which flowed down more greatly than the width of face of a metal plate twisting, and sticking to a roll The manufacture method of the lamination metal plate characterized by once drawing in from the hole which carried out opening in order to prevent that an overcoat resin coils around a sticking-by-pressure roll [ near the pressure-welding section ], injecting a gas subsequently, twisting an overcoat resin, and making it exfoliate from a roll, [0022] (4) Carry out the pressure welding of the sticking-by-pressure roll to the preheated metal plate which was twisted around the roll with a volume. In the method of manufacturing the lamination metal plate which flows down the thermoplastics film fused from the T die through the extruder in the gap of a sticking-by-pressure roll and a metal plate, covers thermoplastics to a metal plate, and twists and pulls out a metal plate subsequently to a sticking-by-pressure roll While making larger than the width of face of a metal plate width of face of the thermoplastics film which flows down in the gap of a sticking-by-pressure roll and a metal plate, having it in the crosswise center section of the thermoplastics film and covering full [ of a metal plate ] While preparing the hole with which the portion by which the overcoat was carried out twisted it, and the resin carried out opening on the surface of the roll in order to prevent the thermoplastics film which flowed down more greatly than the width of face of a metal plate twisting, and sticking to a roll the manufacture method of the lamination metal plate characterized by scratching the resin which once drew in from the hole which carried out opening in order to prevent that an overcoat resin coils around a sticking-by-pressure roll [ near the pressure-welding section ], and subsequently adhered to the roll front face mechanically on the lower stream of a river of a roll front face with a volume -- it comes out

[0023] Hereafter, this invention is explained in detail, referring to a drawing.

[0024] In this invention, a thick steel plate and a thick galvanized steel sheet, the zinc-alloy plating steel plate, a tin plated steel plate, a tin-alloy plating steel plate, an aluminum plating steel plate, an aluminium alloy plating steel plate, or a stainless steel board of board thickness etc. is first used as a metal substrate from the use used for building materials, such as a roof, a wall, and a partition, the charge of automobile material, the material of a home electrical-and-electric-equipment product, furniture, a can, etc.

[0025] Furthermore, what has an about 0.1-5micro chemical-conversion layer on this is contained.

[0026] In order that a chemical conversion may raise the corrosion resistance of a metal substrate, oxidation resistance, and adhesion, it is performed as surface treatment of a metal plate, and is performed by phosphoric-acid zinc processing, phosphoric-acid iron processing, or the electrolytic chromate treatment.

[0027] Furthermore, after not performing a chemical conversion or performing a chemical conversion, what has an adhesives layer on this is contained.

[0028] An adhesives layer is a layer which applied about several [ at least ]micro adhesives, in order to improve the adhesion of a metal substrate and thermoplastics.

[0029] As these adhesives, the adhesive thermoplastics which has functional groups, such as a denaturation polyethylene resin, a denaturation epoxy resin, and denaturation vinyl resin, is suitable.

[0030] Adhesion is good for the both sides of a metal and the thermoplastics used for covering, for example, in the case of a polyolefine covering steel plate, a denaturation polyolefine like an ethylene-vinyl acetate copolymerization resin or an ethylene-acrylic-acid copolymerization resin is suitable for these.

[0031] The thermoplastics used for covering by this invention For example, a polyethylene-terephthalate resin, Polyolefin resin, acrylic resin, polyester resin, polyamide resin, Vinyl chloride resin, a fluoro resin, polycarbonate resin, a polystyrene system resin, ABS plastics, a chlorinated-polyether resin, a urethane resin, etc. are typical. to polyolefin resin There are a polymer or copolymers, such as ethylene, a propylene, 1-butene, and 1-pentene. as acrylic resin There are a polymer or copolymers, such as an acrylic acid, a methacrylic acid, an acrylic ester, methacrylic-acid ester, and an acrylamide. to polyester resin There are a polyethylene terephthalate, oil free polyester, etc. to polyamide resin There are the so-called Nylon 66, nylon 6, Nylon 610, Nylon 11, etc. to vinyl chloride resin There is a copolymer with vinyl acetate, others, for example, ethylene, etc., and there are a polytetrafluoroethylene, a 3 \*\*\*\*-ized ethylene chloride resin, a 6 \*\*\*\*-ized ethylene propylene resin, \*\*\*\*-ized vinyl resin, \*\*\*\*-ized vinylidene resin, etc. in a fluoro resin. [ homopolymer ]

[0032] Moreover, you may mix and use two or more resins. Moreover, the additive usually used at the time of film creation, for example, a degradation inhibitor, the modifier, the pigment, etc. may be included.

[0033] Moreover, in case it covers with a melting state, you may add cross linking agents, such as amino resin and an epoxy resin, in the range which does not lose a fluidity.

[0034] These thermoplastics is suitably chosen according to needs, such as weatherability, cold district aptitude, thermal resistance, scratch-proof nature, resistance to contamination, chemicals-proof nature, and deep-drawing processability, according to the use of a surface treatment metal plate. For example, a polyolefine is excellent in cold resistance, a polyamide is excellent in abrasion resistance, acrylic resin is excellent in resistance to contamination or chemicals-proof nature, and it is excellent [ a fluoro resin ] in weatherability etc.

[0035] The polyethylene-terephthalate resin is especially useful for an acid-proof use.

[0036] Multilayer covering of that monolayer covering is also of the same kind or a different-species resin is sufficient as a resin. In multilayer covering (for example, a multilayer T die), it can carry out, and a glue line can also be prepared between layers.

[0037] At an interlayer thermoplastics in the upper layer for an adhesive resin to a lower layer for example, by the three-layer T die [ the steel plate which is applying and preheating adhesives ] [ the thermoplastics in a melting state ] It can extrude in the shape of a film, and the surface treated steel sheet which carried out multilayer covering directly and continuously can be obtained. Or thermoplastics can be obtained in the 1st lower layer and the surface treated steel sheet which extruded thermoplastics in the shape of a film by the four-layer T die in the 4th best layer at the 3rd interlayer, and carried out multilayer covering of the adhesive resin directly and continuously can be obtained for the adhesive resin which is in the steel plate which is preheating at a melting state to the 2nd interlayer.

[0038] A drawing explains a manufacturing process below.

[0039] A metal substrate needs to precede covering a melting resin and it is necessary to preheat it.

[0040] For example, in the case of a polyethylene terephthalate, the preheating of -120

degrees C or more (therefore, about 135-255 degrees C) of melting points (255 degrees C) is desirable.

[0041] By carrying out a preheating, the fluidity of a resin increases and adhesion improves.

[0042] When, especially as for the time of a low, preheat temperature uses a cooling roller when not performing a preheating or, the adhesion of a resin is not enough and a result which lacks in corrosion resistance is brought.

[0043] Although the temperature of a preheating is so desirable that it is high since the fluidity of a resin increases, since a resin and adhesives will decompose if too high, it is not desirable. Moreover, it is not desirable from a viewpoint of energy saving.

[0044] Therefore, it is preferably carried out rather than the temperature of a melting resin below the temperature of a melting resin by 50-degree-C or more low temperature and the preheat temperature of about 50-230 degrees C of usual.

[0045] Drawing 1 carries out the pressure welding of the sticking-by-pressure roll 5 to the front face of the metal substrate 1 which twisted and was twisted around the roll 4 and which it preheated, flows down the thermoplastics film 3 fused from T die 2 through the extruder to the interface of the metal substrate front face and sticking-by-pressure roll 5, and shows the lamination metal-plate manufacture method which twists around the sticking-by-pressure roll 5 the metal plate \*\*\*\*\* (ed) by the metal substrate 1 in the thermoplastics film, and pulls it out.

[0046] Regulation of film \*\* or a surface state is easy for this method. For example, it is also easy regulation of surface gloss and to give an embossing pattern to a front face.

[0047] As for the metal substrate 1 with which the elevated-temperature melting resin 3 was covered, cooling \*\*\*\*\* is performed. Even if cooling may perform a water spray for example, after air cooling and it makes it pass through a water-cooled tub, you may let a cooling roller pass.

[0048] Thus, in this invention, although the surface treatment metal plate of this invention is obtained, since the hole which carries out opening was prepared in the front face of the shaft-orientations portion of the roll with a volume which a thermoplastics film covers, the roll surface coating area of an overcoat resin decreases, and, only in the part, the adhesion force on the front face of a roll of a resin decreases [ effective-area integration ].

[0049] Moreover, since the gas feeder style which injects a gas to the hole of opening which a thermoplastics film covers was prepared, the resin film which covered the roll front face with a volume surfaces with a gas.

[0050] Furthermore, since the gas which had between the surfacing resin film and roll front faces injected flows, while a resin film is cooled, a roll front face is also cooled and the adhesion force on the front face of a roll of a resin decreases further.

[0051] drawing 2 -- a pressure welding -- the section -- six -- near -- setting -- an overcoat -- a resin -- sticking by pressure -- a roll -- five -- coiling -- a thing -- preventing -- a sake -- opening -- having carried out -- a hole -- from -- once -- drawing in -- once -- a volume -- with -- a roll -- four -- a side -- adhering -- make -- having adhered -- a resin -- a pressure welding - a point -- a lower stream of a river -- a roll -- from -- a gas -- injecting -- stripping -- or --

[0052] As for the sticking-by-pressure roll used for this invention method, what it is the desirable and metal roll of internal water cooling which consists of the quality of the materials, such as a resin, a detachability good fluororubber, and silicone rubber, and lowered the roll skin temperature is desirable in respect of detachability.

[0053] Moreover, since a sticking-by-pressure roll has big influence on the appearance of a resin, a roll front face has a desirable thing smooth as much as possible.

[0054] Drawing 3 is the direction view [ in / drawing 3 / respectively / in the cross section of equipment, drawing 4 , and 5 ] of X-X, and the direction view of Y-Y.

[0055] this invention is the front face of the roll 4 with a volume (roll volume attachment) which the preheating metal plate 1 coils and is passed, made width of face WP of

thermoplastics 3 larger than the board width WM of a metal plate 1, and has prepared the hole which carries out opening to the shaft orientations of the portion to cover to the thermoplastics which covers opening of a roll front face with a volume.

[0056] Drawing 3 shows having formed the wind box which slides on this roll inner skin as a method of supplying a gas to the hole.

[0057] Moreover, although the gas is injected from the pressure-welding position of a nip roll 5 in drawing 3 in the field in which a metal plate 1 separates from the roll 4 with a volume behind, a wind box is extended, also about the roll front face with a volume which thermoplastics has not covered, if a gas is made to inject, a roll skin temperature can be made to be able to fall more and cooling of the thermoplastics which covered the roll front face can be promoted.

[0058] Furthermore, if a wind box is made into block construction by the circumferencial direction, strength can be attached to gaseous injection or the injection pattern of a finer gas can be realized.

[0059] However, the position which injects a gas needs to select a proper position by the thermoplastics flowing down, warning against the thermoplastics of the melting state which flows down from a T die not shaking, or making it a position which will be in the state where it cannot stabilize and flow down.

[0060] Drawing 4 shows having formed the hole 10 penetrated in the roll thickness direction with a volume into the portion which lines thermoplastics and detachability good rubber 52, for example, poly 4 \*\*\*\*-ized ethylene rubber, and thermoplastics covers in the periphery of the metal sleeve 51.

[0061] Furthermore, supply of the gas to this hole forms the wind box 9 which slides on the inner skin of a roll, and a gas is supplied to this wind box by the gas supply pipe 61.

[0062] In addition, this wind box is connected with a part for a shank by the socket 56, and since it is pressed against the inner skin of a roll with the spring 58 inserted into the socket, there is little leakage at bulb of the gas to inject.

[0063] Furthermore, the axial structure of this equipment is the double-pipe structure of an outer tube 55 and a shaft 54, and moving part 53 is between this outer tube and a shaft. The slot 63 can be open to shaft orientations at the outer tube, and a socket 56 can move now to shaft orientations.

[0064] When the move mechanism is shown, this moving part and shaft are in the relation between a nut and a bolt, and if a shaft rotates, moving part will move in connection with it.

[0065] That is, if a shaft is rotated, a wind box is movable to shaft orientations with a socket. Therefore, it can respond now to change of the board width of a metal plate which carries out plate leaping.

[0066] Moreover, the injection width of face of the wind box in the direction of roll axis with a volume can inject the gas to inject to thermoplastics effectively, if it is made the same as the resin width of face of the thermoplastics which covers a roll front face.

[0067] In addition, a shaft is fixed and this equipment has structure which only a sleeve 51 rotates through bearing 59.

[0068] Drawing 5 shows the position of the hole which carries out opening. As for the hole which carries out opening, it is good to prepare in the field to the resin width of face WPmax of the thermoplastics which covers the roll front face in the maximum board width WMmax from the minimum board width WMmin of the metal plate by which plate leaping is carried out.

[0069] The enlarged view of the portion of a hole is shown in drawing 6 . About the form of a hole, what configuration is sufficient as a round shape, a square type, a rectangle type, a rhombus, etc.

[0070] Moreover, about arrangement of a hole, as shown in drawing 6 , in order to lessen roll surface coating area of thermoplastics, it is good to make it as dense as possible and to

arrange.

[0071] Furthermore, the U-U cross section in drawing 6 is shown in drawing 7 and 8 about the structure of a hole. As shown in drawing 7 and 8, in order to reduce the roll surface coating area of thermoplastics, injecting a gas with sufficient vigor, the structure which makes the aperture by the side of a roll front face larger than the aperture by the side of a roll inside, for example, two-step hole structure, ( drawing 7 ), and tapered-bore structure ( drawing 8 ) are good.

[0072] Moreover, about the size of the hole on the front face of a roll, as shown in drawing 9 , in order to avoid that thermoplastics is poured into a hole by the pressure welding, it is good [ it is a pressure-welding position with a nip roll, and ] to make it a bigger hole than the nip width of face of a nip roll, as shown in drawing 10 .

[0073] Although the old example makes the hole the breakthrough, as shown in drawing 11 - 12, it is good also as a non-breakthrough. As for the supply direction of the gas at this time, it is good to consider as a roll front face or a roll end face.

[0074] Or it slides the method and gas charging line which set a nozzle and arrange a hole and a gap as the supply method of the gas to inject in addition to a wind box directly and arranges, there is the method of setting and arranging a gap etc.

[0075]

[Example 1] In the equipment shown in drawing 1 , the roll of the side which touches [ a steel plate and ] using the roll of a couple with an outer diameter of 300mm Near [ where the resin protruded from the steel plate contacts ] the roll surface portion, the lamination metal plate manufacturing installation which prepared puncturing is used. After preheating this steel plate at 200 degrees C by the thickness of 0.3mm, using a surface treated steel sheet with a width of face of 800mm as a metal plate, melting extrusion flowing down of the polyethylene-terephthalate resin was carried out from the T die through the extruder at the interface of the above-mentioned steel plate and a roll.

[0076] Resin temperature is 280 degrees C, covering thickness is 50 micrometers, covering width of face is 860mm, an overcoat is widely carried out to both sides every 30mm from a steel plate, and line speed is 20 m/min.

[0077] Consequently, it checked that the resin protruded from the steel plate did not carry out coiling round, either, but could be stabilized and operated on the roll which touches a steel plate side.

[0078]

[Example 2] In the equipment shown in drawing 1 , after using the lamination metal plate manufacturing installation using the roll of a couple with an outer diameter of 300mm and preheating this steel plate at 200 degrees C by the thickness of 0.3mm, using a surface treated steel sheet with a width of face of 800mm as a metal plate, melting extrusion flowing down of the polyethylene-terephthalate resin was carried out from the T die through the extruder at the interface of the above-mentioned steel plate and a roll.

[0079] Resin temperature is 280 degrees C, covering thickness is 50 micrometers, covering width of face is 860mm, an overcoat is widely carried out to both sides every 30mm from a steel plate, and line speed is 40 m/min.

[0080] The roll of the side which touches [ a steel plate and ] had prepared the open cibarium in the front face, from the pressure-welding position, injected the gas from the open cibarium on the front face of a roll, and operated it in the 20mm section.

[0081] It checked that the resin protruded from the metal plate as a result did not carry out coiling round, either, but could be stabilized and operated on the roll which touches a steel plate side.

[0082]

[Example 3] In the equipment shown in drawing 2 , after using the lamination metal plate manufacturing installation using the roll of a couple with an outer diameter of 300mm and

preheating this steel plate at 200 degrees C by the thickness of 0.3mm, using a clo mate surface treated steel sheet with a width of face of 800mm as a metal plate, melting extrusion flowing down of the polyethylene-terephthalate resin was carried out from the T die through the extruder at the interface of the above-mentioned steel plate and a roll.

[0083] Resin temperature is 280 degrees C, covering thickness is 50 micrometers, covering width of face is 860mm, an overcoat is widely carried out to both sides every 30mm from a steel plate, and line speed is 60 m/min.

[0084] The roll of the side which touches [ a steel plate and ] had prepared the open cibarium in the front face, from the open cibarium on the front face of a roll, was attracted or injected and operated the gas.

[0085] From the pressure-welding position, it continued for 30mm, and drew in, and air was injected further on the lower stream of a river, and it operated with the scraper on the lower stream of a river, removing the resin adhering to the roll front face in which the open cibarium was prepared.

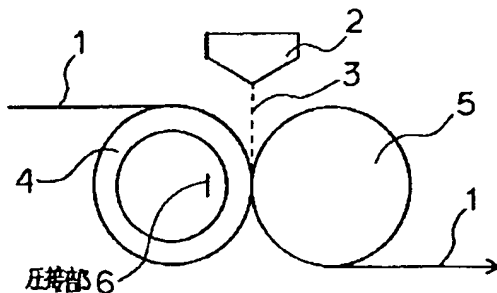
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## DESCRIPTION OF DRAWINGS

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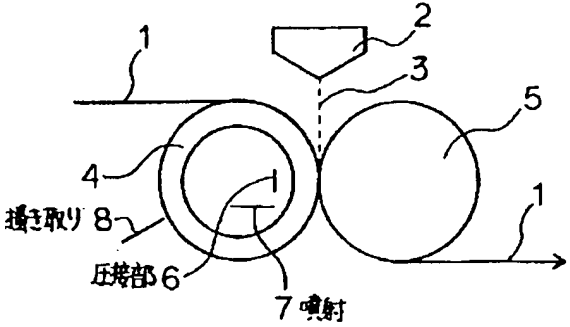
[Brief Description of the Drawings]

[Drawing 1] It is explanatory drawing of the method of covering by flowing down a melting resin to the interface of a metal substrate and a roll.





[Drawing 2] It is explanatory drawing of the method of covering by flowing down a melting resin to the interface of a metal substrate and a roll.



[Drawing 3] Explanatory drawing of this invention method.